Modelling the Cancer Growth Process by Stochastic Delay Differential Equations Under Verhults and Gompertz's Law

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ABSTRACT
In this paper, the uncontrolled environmental factors are perturbed into the intrinsic growth rate factor of deterministic equations of the growth process. The growth process under two different laws which are Verhults and Gompertz's law are considered, thus leading to stochastic delay differential equations (SDDEs) of logistic and Gompertzian, respectively. Gompertzian deterministic model has been proved to fit well the clinical data of cancerous growth, however the performance of stochastic model towards clinical data is yet to be confirmed. The prediction quality of logistic and Gompertzian SDDEs are evaluating by comparing the simulated results with the clinical data of cervical cancer growth. The parameter estimation of stochastic models is computed by using simulated maximum likelihood method. We adopt 4-stage stochastic Runge-Kutta to simulate the solution of stochastic models.

KEYWORDS: Verhults law; Gompertz law; deterministic model; stochastic delay differential equations

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